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Feature Article - Understanding the building lifecycle by its cyclical nature

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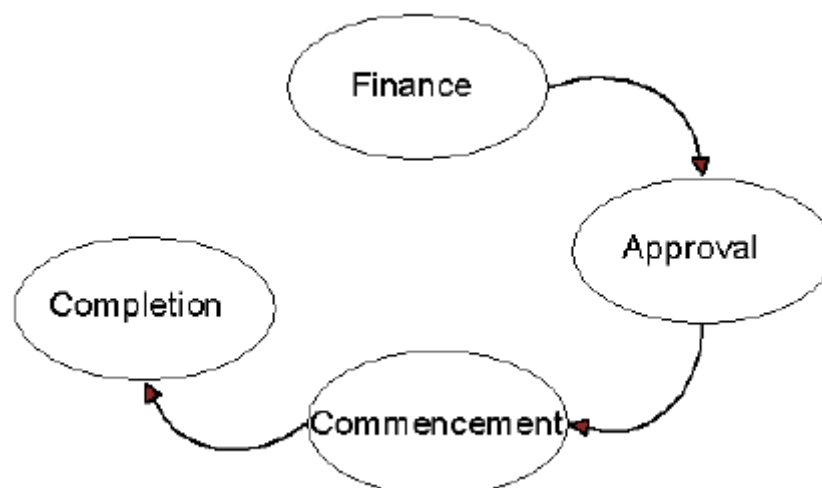
INTRODUCTION

The Australian housing sector has been the topic of much discussion in recent times. Understanding the dynamics at work in this sector is of great interest to policy makers. A diverse range of indicators are required to capture the working of the housing sector. These include indicators of affordability and house prices, levels of home ownership, rental vacancies, level of housing debt and levels of building activity. This article will focus on the level of private housing building activity¹.

The building of private housing represents about 2.5%² of Gross Domestic Product (GDP). This may not appear to be a large percentage but, to place this into some perspective, Agriculture makes up about 2.2% of GDP, General Government 3.8% and Retail Trade 5.3%.

Figure 1 simplifies the relationship between each step in the construction of a private dwelling. In this simple example, the finance for a dwelling is obtained by an individual (or individuals). This leads to an approval for construction. The construction is commenced and eventually completed. It should be noted that the link between each step is not necessarily guaranteed. For example, developers may believe that approved properties will be difficult to sell and will delay (or possibly cancel) the development until a later date. It may also be the case that finance to purchase a completed dwelling could be obtained at the end of the process. In some cases, specific finance for the dwelling may not even be needed.

FIGURE 1: LIFECYCLE OF DWELLING CONSTRUCTION.



Each step in this process can be seen as part of the building lifecycle. Throughout this article the term “building lifecycle” will be used to refer to all four steps in the process.

While many industries experience steady growth over time, each component of the building lifecycle exhibits periods of expansion followed by periods of contraction. The movements in the dwelling lifecycle are typically greater than most other components in the economy. As a result its impact would be more significant to the movements to GDP rather than its levels.

The movements in the building lifecycle are related to movements in the wider economy. The linkages between the two are complex and it is not always clear what is driving what. For example, a stronger economy might lead to increased building, or increased building might lead to a stronger economy.

In this article the relationship between each stage of the building lifecycle is examined. We use four time series of data in this analysis, one for each of the four building lifecycle stages listed above. Turning point and correlation analysis are used to help understand the relationship between each stage.

METHODS: TURNING POINT AND CORRELATION ANALYSES

Turning point analysis is used to compare the patterns of peaks and troughs in each series. It involves capturing the business cycle component from each series (by identifying the cyclical component from the other time series components such as seasonal, irregular and long-term trend components) and then comparing the respective peaks and troughs over time.

Broadly, this entails applying Henderson moving averages to remove short cycles of less than two years and very long cycles of more than eight years. The business cycle component of the time series is what is left behind. A full business cycle represents the movement from peak - trough - peak or from trough - peak - trough.

Correlation analysis is used to measure the degree of association between two variables. The stronger the correlation (i.e. closer to +1 or -1), the closer the association between the two variables. By examining the correlation between the business cycle component of two series, the strength of the relationship can be assessed. The analysis can also examine whether there is correlation with future (or previous) periods (lead-lag analysis).

DATA

Estimates for construction finance are based on the monthly Housing Finance for Owner Occupation Survey (cat. no. 5609.0). This represents the number of finance commitments for the construction of dwellings for owner occupation. This series does not include finance for investment properties. An ideal series would include both owner occupier and investment loans.

The approvals series is based on the monthly Building Approvals collection (cat. no. 8731.0).

Private dwelling units commenced and completed data comes from the quarterly Building Activity Survey (cat. no. 8752.0) conducted in March, June, September and December each year.

Monthly data are aggregated up to form quarterly values. All series used in the analysis are seasonally adjusted.

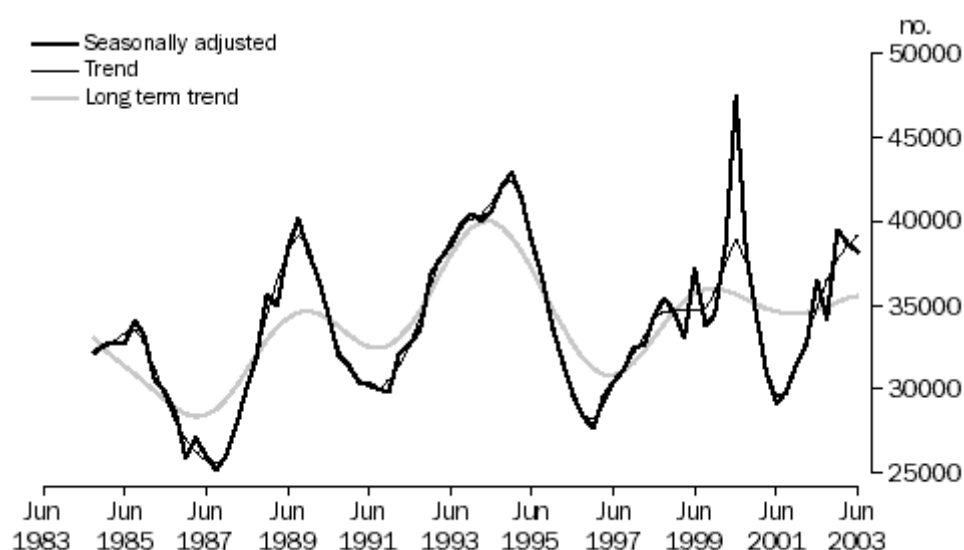
BUILDING ACTIVITY

Figure 2 outlines the movements in the number of properties completed in each quarter between September 1984 and June 2003. The seasonally adjusted, trend and long term trend are all displayed. The number of completions helps provide an overall view of the level of building activity.

The large spike in the seasonally adjusted series leading up to June 2000 is linked to the introduction of The New Tax System (TNTS). The change in taxation methods brought forward large amounts of building activity prior to the introduction of TNTS.

Following this peak the number of completions fell to their lowest level since 1997. Some 27,000 dwellings units were completed in the March quarter of 2001. The combination of lower interest rates, increased demand for investment properties and the First Home Owners Grant (introduced in June 2000) helped increase the number of completions during 2002 and 2003.

FIGURE 2: BUILDING COMPLETIONS



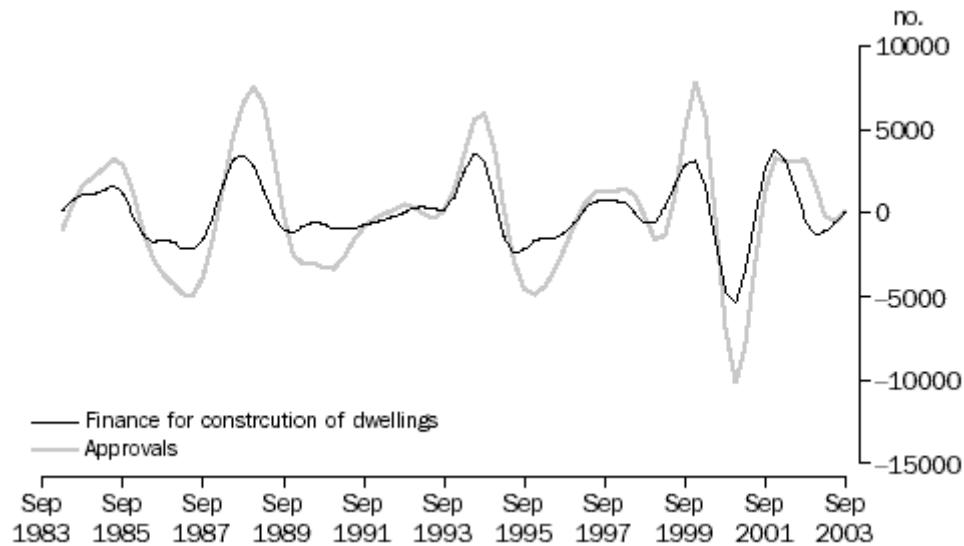
RESULTS OF ANALYSIS

The relationships between finance, approvals, commencements and completions were analysed using turning point analysis and correlation analysis. All series referred to in the analysis are the business cycle component of the seasonally adjusted series.

Finance and Approvals

Figure 3 illustrates the business cycle component of finance and approvals (as standard deviations between the trend and the long-term trend, to provide a clearer visual representation of the turning points). For example, when the series dips below zero this represents growth below the long-term trend. When the series is above zero this represents growth which is above the long-term trend.

FIGURE 3: BUSINESS CYCLE TURNING POINT ANALYSIS, FINANCE AND APPROVALS.

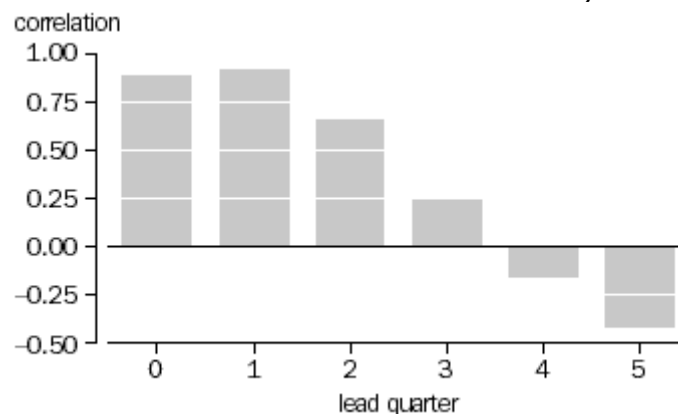


As shown in Figure 3, finance and approvals each had four cycles between September 1984 and September 2003. The finance series tends to lead the approvals series' peaks and troughs by up to two quarters over the period. Finance reached a trough in December 2000 which was followed (one quarter later) by a trough in approvals in March 2001.

Interestingly, between 1999 and 2003 the business cycle component in finance and approvals seems to have increased in magnitude and become shorter in duration. The combination of TNS, lower interest rates, increased demand for investment properties, the introduction of the First Home Owners Grant and other factors may help explain these phenomena.

Results from the correlation analysis show that there is a positive linear association between the business cycles of the finance and approvals series over the period 1984 to 2003. The strength of the relationship was tested between finance in one quarter and approvals in that quarter and in the subsequent 5 quarters (Figure 4). The strongest correlation coefficient (0.92) was found between the finance series in one quarter and the approvals series in the next quarter. That is, over the period the most likely outcome is finance leading approvals by one quarter.

FIGURE 4: BUSINESS CYCLE CORRELATION COEFFICIENT, FINANCE AND APPROVALS.

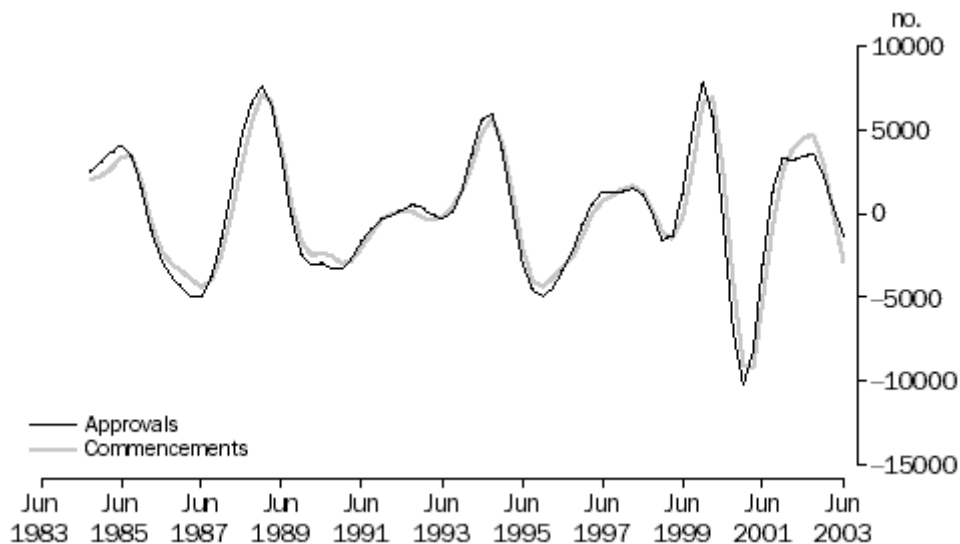


Building Approvals and Commencements

Turning point analysis was also conducted for the approvals and commencements series (Figure 5). Approvals tend to lead commencement peaks and troughs by between zero and one quarter.

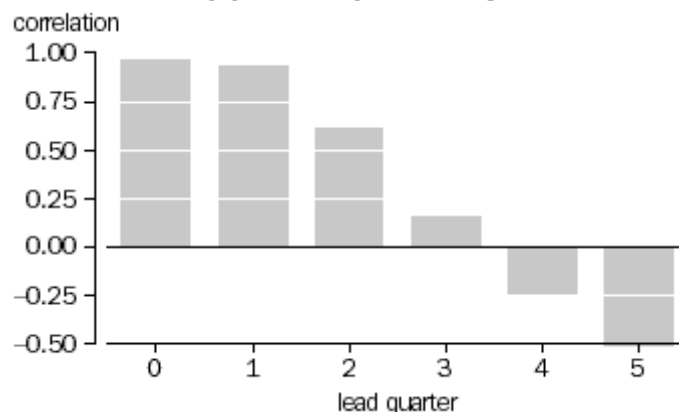
FIGURE 5: BUSINESS CYCLE TURNING POINT ANALYSIS, BUILDING APPROVALS AND

COMMENCEMENTS.



There was a peak in the approvals series in December 2001 and a peak in commencements three quarters later (in September 2002). Commencements have been declining since then.

FIGURE 6: BUSINESS CYCLE CORRELATION COEFFICIENT, BUILDING APPROVALS AND COMMENCEMENTS.



As for finance and approvals, the business cycle component in the approvals and approval series seems to have increased in magnitude and become shorter in duration after 1999.

Using the business cycle component of the two series we calculated correlations between approvals and commencements to ascertain the strength of the leading relationship (Figure 6).

The results of the estimated correlations coefficients show that the strongest relationship (0.97) was found for approvals in one quarter and commencements in the same quarter. The correlations coefficient for a one quarter lag is only marginally lower at 0.93. That is, a dwelling approved in one quarter will most likely be commenced in the same quarter.

Commencements and Completions.

FIGURE 7: BUSINESS CYCLE TURNING POINT ANALYSIS, COMMENCEMENTS AND COMPLETIONS.

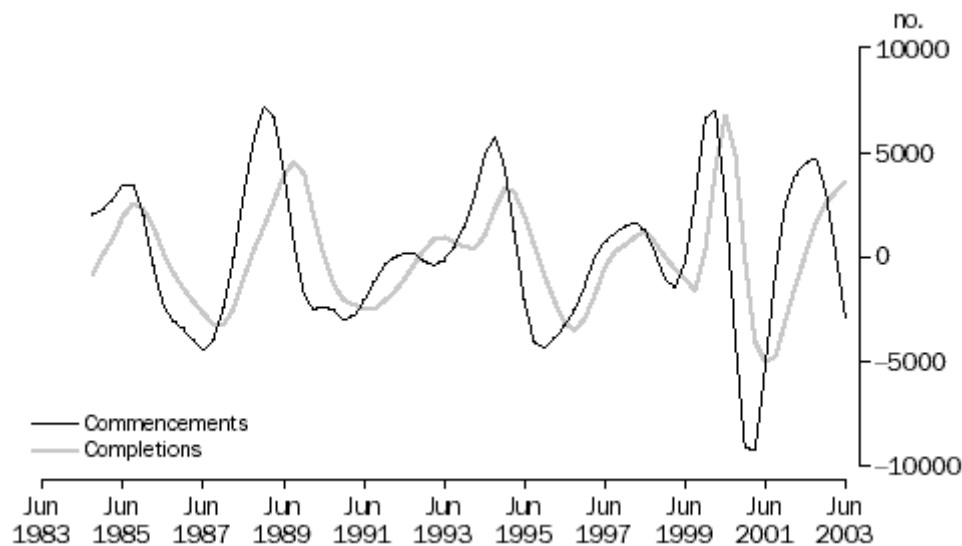
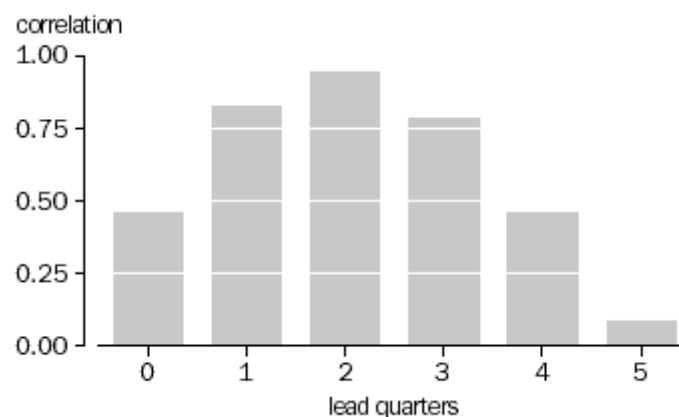


Figure 7 depicts a very similar situation to the previous analysis. From September 1984 to June 2003 peaks in commencements lead peaks in completions by up to four quarters. Troughs in commencements leads troughs in completions by up to three quarters.

FIGURE 8: BUSINESS CYCLE CORRELATION COEFFICIENT, COMMENCEMENTS AND COMPLETIONS.



Results from the correlation analysis (Figure 8) show that the strongest relationship (0.94) exists between dwellings commenced in one quarter and dwellings completed two quarters later.

The turning point analysis indicated a leading relationship between commencements and completions of up to four quarters. The turning point analysis has shown that the most likely outcome is a two quarter leading period.

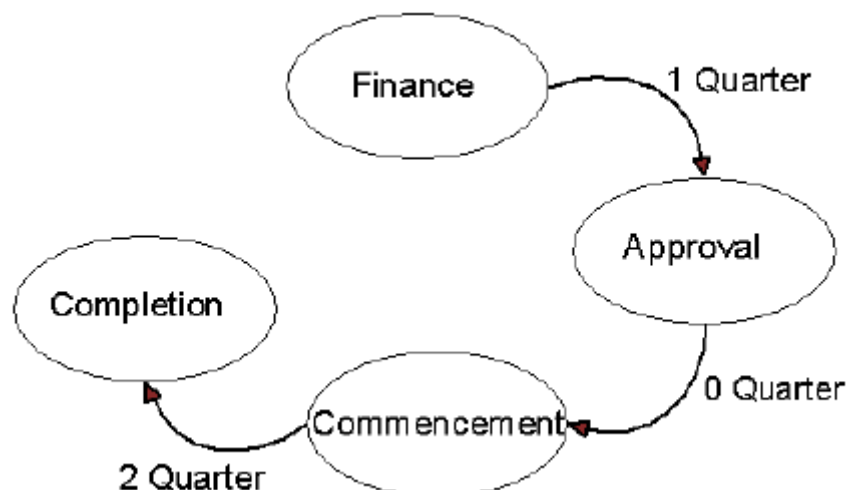
Commencements peaked in September 2002 and have fallen steadily since. The correlation analysis indicates that following this peak the most likely outcome is a peak in completions two quarters later, but this is not yet evident in the data.

Additional Analysis

The results of the analysis indicate that it takes on average approximately three quarters (Figure 9) from obtaining finance for the construction of owner-occupied dwelling to its completion. This is also supported by analysis (not included in this article) testing the relationship between approvals and completions, which indicated that a dwelling is typically completed two quarters

after its approval.

FIGURE 9: LIFECYCLE OF DWELLING CONSTRUCTION.



Throughout the analysis we have seen that since around 1999 the magnitude and the duration of the business cycle component in all the series has altered. TNTS, First Home Owners Grant and historically low interest rates are some of the factors which may be contributing to this change. It is unclear at this stage whether the business cycle changes are temporary or whether they are premature in nature.

To help further understand the changes in the building lifecycle since 1999 correlation coefficients have been for three periods of equal duration. The commencements and completions series have been used as an example.

Correlation statistics were calculated for three periods; period 1 - December 1984 to December 1990, period 2 - March 1991 to March 1997 and period 3 - June 1997 to June 2003. Correlation coefficients were again calculated for commencements and completions.

FIGURE 10: CORRELATION COEFFICIENT FOR THREE PERIODS, COMMENCEMENTS AND COMPLETIONS.

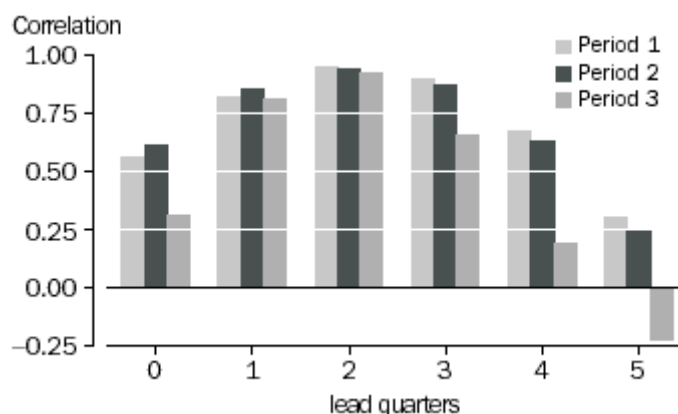


Figure 10 shows the decline in the strength of the relationship between approvals and completions for period 3. The correlations coefficients for the three and four quarters intervals are considerably lower.

This may indicate an improved efficiency in the construction of dwellings. That is, dwellings are being completed in a shorter amount of time. But if this is the case, then one would expect the

correlation coefficients for quarters one and two to be larger. However, this has not occurred.

This implies that the reliability of the lead-lag relationship between approvals and completions during period 3 (June 1997 - June 2003) may be weaker than in the previous two periods.

CONCLUSION

This article has used turning point and correlation analysis to gain an understanding of the dynamics in the building lifecycle. The results of the analysis indicate that the most likely scenario is a one quarter lag between finance and approval, with approval and commencement occurring in the same quarter and a further two quarters until completion.

Both the correlation and turning point analyses indicate that the business cycle seems to have become more volatile and shorter in recent times. The lead-lag relationships also appear to have weakened.

FURTHER INFORMATION

For more information about the cyclical nature of the building lifecycle please contact Mr Terry Rawnsley on Canberra (02) 6252 6307 or email <terry.rawnsley@abs.gov.au>

ENDNOTES

1. Private housing building activity is the building of any housing destined for private ownership. The ownership of a building is classified as either public sector or private sector according to the sector of the intended owner of the completed building as evident at the time of approval.

2. Based on Industry Gross Value Added. Private residential housing building activity falls within the wider Construction industry. The Construction industry as a whole accounts for about 7% of GDP. Source: ABS (cat. no. 5206.0 and cat. no. 8755.0)

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